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Analyzing the Self-Assessment on the Vocational Qualifications by Age and Gender: The Example of Geographic Information Systems (GIS)

Dilara Unuvar-Unluoglu
Eskisehir Technical University

Nazire Burcin Hamutoglu
Eskisehir Technical University

Saye Nihan Cabuk
Eskisehir Technical University

Alper Cabuk
Eskisehir Technical University

Abstract: Geographic Information Systems (GIS) are widely used in various sectors and disciplines. Therefore, many individuals of different ages and genders are currently employed in this area. Although specific vocational standards and qualifications are developed for professionals, individuals' self-evaluations, which are highly dependent on the diversity of variables, are essential for quality. Within this frame, this paper aims to analyze the self-assessment perceptions of graduates from GIS programs regarding age and gender. An online survey based on 43 performance criteria within the vocational qualification units was developed as the data collection tool, and the participants were requested to rate each criterion on a 5-point Likert scale. The average age of the 174 people who participated in the study was 35.75 (SD = 7), while the ages of the participants ranged from 23 to 53 (m = 35,75). There were 115 male participants (66.1%) and 59 female participants (33.9%). The results showed that there is not any relation between age and the self-efficacy levels of vocational qualifications ($p>0.05$). When the t-test results were examined for the comparison of the self-efficacy levels of vocational qualifications according to the gender of the participants, no significant difference was observed. To sum up, within the scope of GIS Specialist National Competence, the vocational qualifications self-efficacy perceptions of graduates from GIS are not affected by gender and are not related to age.

Keywords: Vocational qualifications, Gender, Geographical information systems, GIS Programs

Introduction

According to Burrough's (1998) explanation, Geographical Information Systems (GIS) involve a range of tools used to collect, store, query, transfer, and display accurate data on the Earth for a specific objective. In the following process, the concept of GIS has been broadened as a set of hardware, software, personnel, geographic data, and methods that fulfill the functions of collecting, storing, processing, managing, spatial analysis, querying, and presenting large volumes of geographic data to help users in spatial/location-based decision-making processes to solve complex, social, economic, environmental, etc. problems in the world (Unlu, 2019). Today, the availability of geospatial data and technologies, advancements in geographical data infrastructures, and the existence of web-GIS resources have made GIS an essential tool in modern society due to its simplicity and quick use.

To explain, GIS is a kind of technology that a variety of professional occupations need to handle geographical concerns in their specific sectors. GIS education and training activities have become even more important over the last 20 years regarding its widespread use and capabilities. Generally, the term "education" refers to the whole set of actions undertaken to educate individuals with expertise (Karademir, 2013). Bowlick et al. (2019) state that GIS education is often structured according to various curricula. In this regard, GIS is an interdisciplinary field that involves several information, knowledge, and skill categories. In other words, education in GIS consists of various components, such as teaching, study, learning, and evaluations. Therefore, each course within the different academic programs must have SMART goals. The meaning of having "SMART" course objectives—which stand for "specific, measurable, attainable, realistic, and time-bound"—a necessity for developing acceptable learning outcomes and evaluations (Hodza et al., 2021) should be understood. In this approach, the advantages of education in GIS include providing individuals with information, skills, and talents that are significant in the geospatial technology business and creating a preferred future. This highlights the need for a practical and open-ended conceptual framework to guide the consistent delivery of high-quality GIS education inside as well as across different fields of study and various institutions. The body of knowledge (BoK) about GIS is also continuously updated depending on discoveries and advancements made in GISystems, GIScience, and GIStudies.

Vocational qualifications are an essential factor determining the level and quality of the services received, making them an additional significant concern in the education sector. The level of vocational qualifications and the standard of vocational education have a close and direct relationship with each other. A vocational education should be designed and carried out in such a way as to include learning outcomes, spaces, equipment, and other opportunities that will provide the knowledge, skills, behaviors, and attitudes that will enable the profession to be performed in accordance with the minimum requirements (Cabuk & Cabuk, 2015). In other words, vocational education should be developed and carried out in a framework to include learning outcomes, spaces, equipment, and other opportunities. For this reason, assessing the qualifications through vocational education is important and necessary for understanding and bringing the sector and education priorities closer and continuously improving vocational qualifications.

For this reason, the level of professional competence individuals gain, or the competency of the teachers is measured/evaluated in different studies from different perspectives, such as gender, age, and educational background. Gender is one of the most investigated areas. For instance, according to a study examining future geography instructors' self-assessments, there was no significant difference between male and female participants in terms of their perceptions of their vocational qualifications (Karademir, 2013). Similarly, in a different kind of study that evaluated attitudes, researchers (Nugent et al., 2009) found no statistically significant difference between the self-confidence of male and female participants regarding completing GPS/GIS tasks. Moreover, according to the study that was conducted on geography course teachers by Cimen (2021), the responses given by men and women to the survey question "Do you find yourself vocationally qualified?" showed that there is not a statistically significant relationship between the gender variable and the evaluation of professional self-efficacy. However, within the scope of the same study, a statistically significant relationship was found between the "age variable" and "self-evaluation of professional qualifications." As a result of the analysis, teachers between the ages of 41 and 50 were the group that evaluated their vocational qualification levels as the highest in their self-evaluation (Cimen, 2021). Similarly, a meta-analysis (Weinburgh, 1995) of 18 studies found males to have more positive attitudes than females on their self-assessments.

There is a significant need for qualified GIS personnel in Turkiye. Because of the variety of GIS personnel employment calls from various sectors and projects, it is necessary to align the framework of GIS-related occupations with the minimum standards for GIS training and education programs. Each of these sectors requires an individual set of knowledge and competence. In this context, the term "competence" may be considered a concept that relates to the capabilities, knowledge, and skills necessary to carry out a task and complete the obligations required. It is now an unavoidable requirement and a quality indicator that the education provided at all levels, not just in GIS but also in other sectors, should supply the minimum amount of knowledge, skills, and competence intended to be obtained with that education.

Within this framework, this paper aims to analyze the self-assessment perceptions of graduates from GIS programs given by Anadolu University and Eskisehir Technical University in terms of age and gender. Studies in different fields have shown that self-assessment of professional competencies may vary depending on age and gender. As today's graduates are tomorrow's workers in the sector, whether the current picture of what has become a common tool for a wide range of fields, such as GIS, shows a gender and age-related change can guide decision-makers in terms of gender dynamics in both GIS and labor markets. For this reason, the results are expected to be used by the parties involved in both national policymaking and the education sector.

Materials and Methods

Material

An online survey produced using the learning outcomes and the success criteria described in the three qualification units of the GIS Specialist (Level 6) National Qualification (16UY0255-6) is the primary source material for this research. The information about the participants, including their personal and demographic details, as well as their degrees of GIS education, were gathered in the survey's four main sections. GIS Specialist (Level 6) National Qualification is broken down into three qualification units, which are as follows:

- A1: Workplace Health and Safety, Environmental Protection Measures, Quality Management Systems, and Work Organization;
- A2: Information Security, and
- A3: Technical Organization

Within the scope of the national qualification system, all national qualifications range from level 2 to level 6 and include an A1 unit that addresses workplace safety and health, environmental protection, and quality management standards relevant to the profession.

Method

Development and Implementation of Survey

The study involved analyzing and restructuring the learning outcomes specified in the A1, A2, and A3 qualification units of the GIS Specialist (Level 6) National Qualification. The aim was to create a set of survey questions that focused on individual learning gains. This resulted in expanding the original 38 criteria into 43 questions, designed to facilitate evaluations on a 5-point Likert scale. The scale ranged from 1 (indicating the lowest gain) to 5 (indicating the highest gain). An online survey utilizing the Google Survey Form was shared among graduates of various academic degrees, including the GIS-related certificate program, associate degree, master's degree (with thesis, without thesis, without thesis-distance education), and doctorate programs, which are offered by Anadolu University and Eskisehir Technical University. Participants were instructed to engage in a self-assessment exercise in order to evaluate their perceptions regarding the extent to which they have acquired the specified criteria throughout their education.

Evaluation of Survey Results

This study utilized a method of quantitative investigation to examine the disparities between gender/age and the knowledge and competencies acquired by graduates of target GIS programs within the framework of the qualification units of the GIS Specialist (Level 6) National Qualification. The survey methodology was employed to investigate possible differences in self-evaluations among individuals holding a degree in the GIS field by gender and age, utilizing a t-test. The survey model is a widely used descriptive technique in educational research by which researchers summarize features (such as skills, preferences, attitudes, etc.) of individuals, groups, or the physical setting (such as schools) (Fraenkel et al., 2012). The data analysis was conducted using the SPSS (Statistical Package for the Social Sciences) 21 software package. Normality assumptions regarding the usability of parametric tests were met in the data set created from different universities ($p>.05$). In the analysis phase, an independent sample t-test was used from descriptive statistics and from parametric tests to determine the differences between the independent variable of GIS Specialist (Level 6) National Qualification and program profiles. In addition, Pearson Correlation coefficiency was calculated for each qualification unit of GIS Specialist (Level 6) National Qualification.

Results and Discussion

Survey Participation and Descriptive Statistics

This section analyzes the graduates' assessments of their own GIS skill sets after completing their respective degree programs. Accordingly, the descriptive statistics obtained within the scope of the participants'

perceptions of GIS Specialist (Level 6) National Qualification Units (A1, A2, A3) are shown in Table 1. The data from the survey are almost symmetrical according to the skewness and kurtosis values.

Table 1. Descriptive statistics

	n	Minimum	Maximum	M	sd	Skewness	Kurtosis
A1	174	44.00	85.00	69.67	9.89	-0.159	-0.391
A2	174	13.00	35.00	25.82	5.59	-0.310	-0.199
A3	174	43.00	95.00	78.94	11.59	-0.375	-0.282
ALL	174	5.00	25.00	18.01	4.85	-0.380	-0.359

The participants of the study consisted of 174 volunteers residing in 41 different provinces of Türkiye who completed their graduation in Remote Sensing and GIS Programs between 1997 and 2022 and received an academic degree. Of the participants, 33.9% (f=59) were female, 66.1% (f=115) were male, and their ages ranged between 23 and 53. (sd=7.00; M=35.75).

Although the online survey was shared with over 800 graduates of GIS certificate, associate degree, master's degree (with thesis, without thesis, without thesis-distance education) programs and doctorate programs of Anadolu University and Eskisehir Technical University, only 174 people completed it thoroughly. When broken down by degree level, the results showed that 39.1% (f=68) of the respondents obtained an associate degree, 3.3% (f=4) a certificate, 23% (f=40) a master's degree with thesis, 4% (f=7) a master's degree without thesis, 34.7% (f=43) a master's degree without thesis (distance learning) and 6.9% (f=12) a doctorate.

Table 2. The relationship between GIS specialist (Level 6) qualification units and gender

	Gender	N	X	Sd	df	t	p
A1	Female	59	*68.78*	*10.07*	172	-0.852	0.395
	Male	115	*70.13*	*9.81*			
A2	Female	59	*25.42*	*5.61*	172	-0.662	0.509
	Male	115	*26.02*	*5.59*			
A3	Female	59	*78.86*	*10.72*	172	-0.063	0.949
	Male	115	*78.98*	*12.06*			
ALL	Female	59	*18.81*	*4.51*	172	1.568	0.119
	Male	115	*17.60*	*4.99*			

When the t-test results for independent samples for the comparison of qualification units according to participants' gender are analyzed in Table 2, none of the dimensions of A1 (t=-0.852, p>0.05); A2 (t=-0.662, p>0.05), A3 (t=-0.063, p>0.05) and ALL (t=1.568, p>0.05) create a significant difference.

Table 3. The relationship between GIS specialist (Level 6) qualification units and age

	Age	A1	A2	A3	ALL
Age	1				
A1	0.028	1			
A2	0.135	0.586**	1		
A3	-0.048	0.346**	0.390**	1	
ALL	-0.036	0.223**	0.378**	0.652**	1

**<0.01

When Table 3 is examined, it is seen that there is no significant relationship between the ages of the participants and their perceived competency levels in the GIS Specialist (Level 6) National Qualification Units (p>0.05).

Discussions

Self-assessments provide insight into an individual's vocational qualifications and career aspirations, and the impact of age and gender on vocational qualifications is an essential topic in today's workforce. When considering age, it is important to understand that vocational qualifications can be obtained through various pathways, including formal education, training programs, certifications, and work experience. Different age groups may exhibit variations in terms of access to educational opportunities, professional experience, and career progression, which can impact their self-assessment of GIS qualifications. Moreover, it is generally thought that older individuals may face barriers to using the skills of modern technologies. However, they also tend to have more work experience, which may balance out the disadvantage.

Secondly, gender is another critical factor to consider. Historically, specific fields, including GIS and other STEM (Science, Technology, Engineering, and Mathematics) disciplines, have been dominated by males. However, efforts have been made to promote gender equality and encourage female participation in these fields. Today, gender gaps still exist across different industries and levels of education. Women are less likely to attain vocational qualifications in fields that are accepted as male-dominated, such as construction and engineering. Statistical data reveals a significant gap in qualifications between genders in certain fields, highlighting the need for increased awareness and support for women in these industries. Additionally, supporting women in their vocational qualifications can advance their careers, benefiting both the individual and the organization. This benefits both individuals and organizations by creating a more inclusive and diverse workplace.

This analysis of vocational qualifications' self-assessments on GIS aims at understanding how different demographic factors can affect vocational qualifications. With this knowledge, creating a more equitable workforce could be possible. The results indicated no significant relationship between age and the competency levels defined in the qualification units of GIS Specialist (Level 6) National Qualification. Similarly, no significant difference was observed based on gender. Therefore, the study concludes that within the scope of GIS Specialist (Level 6) National Qualification, the perceived competency levels of GIS program graduates are not affected by gender and are not related to age.

Conclusion and Recommendations

The study is predicated on self-evaluation, and self-assessment of vocational qualifications refers to individuals' evaluation of their skills, knowledge, and competencies in a specific field. In other words, each individual evaluated the questions based on their perspective and indicated their proficiency level concerning the knowledge or skill. Analyzing self-assessment data is significant in providing insights into the distribution of vocational qualifications among different demographic groups, including age and gender. In summary, the vocational self-efficacy perceptions of GIS graduates within the GIS Specialist (Level 6) National Qualification scope stay unaffected by gender and indicate no correlation with age.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

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Author Information

Dilara Unuvar-Unluoglu
Eskisehir Technical University
Eskisehir, Turkey

Nazire Burcin Hamutoglu
Eskisehir Technical University
Eskisehir, Turkey

Saye Nihan Cabuk
Eskisehir Technical University
Eskisehir,Turkey
Contact e-mail: *sncabuk@eskisehir.edu.tr*

Alper Cabuk
Eskisehir Technical University
Eskisehir - Turkey

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